APPENDIX D:

Monitoring by Other Agencies and Partnership Opportunities

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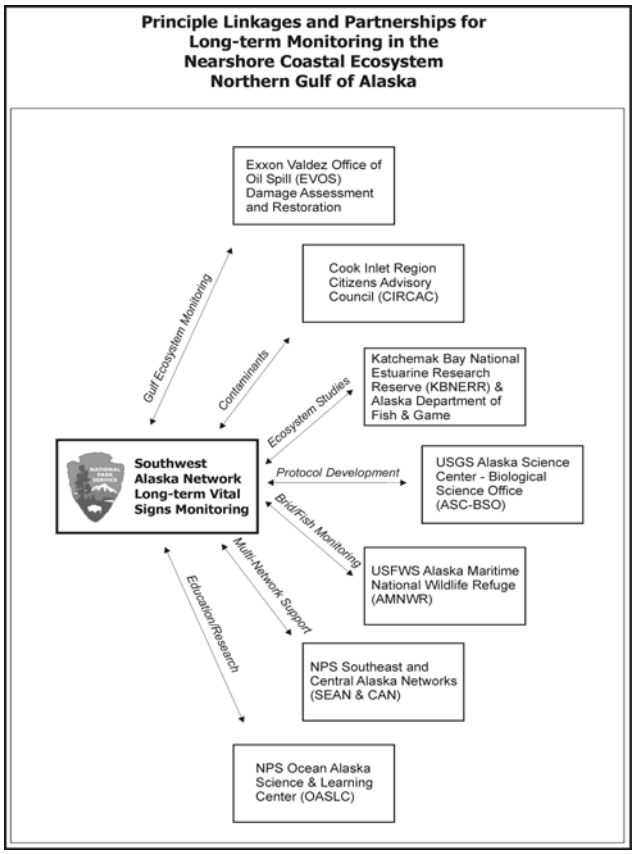
Coastal Monitoring

Consortiums

Exxon Valdez Office of Oil Spill

The Exxon Valdez Office of Oil Spill (EVOS) Damage Assessment and Restoration manages research and monitoring projects for the Exxon Valdez Trustee Council. Several National Oceanic and Atmospheric Administration (NOAA) agencies are involved in these research and monitoring efforts including the Auke Bay Laboratory (ABL), National Marine Fisheries Service (NMFS), and many contractors. NOAA is represented on the Exxon Valdez Trustee Council by the Alaska Regional Administrator of the National Marine Fisheries Service.



The EVOS Northern Gulf of Alaska study area extends from eastern Prince William Sound to the western edge of the Alaska Peninsula and include coastal lands of all Park Units with the SWAN. EVOS research and monitoring is directed at offshore and nearshore marine waters, estuarine, freshwater and terrestrial environments and the interaction of geologic, climatic, oceanographic, and biologic processes.

Monitoring Programs

In October 2002 EVOS initiated the Alaska Ecosystem Monitoring and Research (GEM) program, a long-term commitment to gathering information about the physical and biological components that make up this world-renowned marine ecosystem. What makes GEM unique is that it incorporates interagency cooperation and collaboration, public involvement and accessible, informative data and information on the Gulf of Alaska ecosystem.

The flagship of the GEM program will be a core monitoring program, which, when combined with the monitoring efforts of other resource agencies and research entities, will help detect environmental change over time and greatly expand understanding of the Gulf of Alaska ecosystems. The program will also include short- and long-term research using the latest technological breakthroughs in marine science. With these, the

GEM program will provide a better understanding of the complex processes in the ocean.

Cook Inlet Region Citizens Advisory Council

The Cook Inlet Region Citizens Advisory Council (CIRCAC), created by the Oil Pollution Act of 1990 and funded by industry, has a federal mandate to monitor for environmental impacts of oil-related activities in Cook Inlet including coastal areas of Lake Clark and Katmai National Parks. It focuses on monitoring for petroleum hydrocarbons throughout the inlet. In 2003, SWAN will partner with CIRCAC to conduct an intertidal inventory and mapping effort along the Katmai and Aniakchak coastlines.

Monitoring Programs

Major focus is to collect intertidal data that would aid in assessing effects of an acute impact, such as an oil spill. The intertidal zone is the area most damaged by nearshore oil spills and the existing intertidal data for Cook Inlet are not adequate for characterizing abundance and variation in biological resources or hydrocarbons. The major steps that will be taken by the CIRCAC are:

- Establish a baseline program for Cook Inlet beaches that are most likely to be exposed to crude oil from a catastrophic oil spill.

- Identify the most suitable target species for use as sentinel organisms, e.g., razor clams on sand beaches, deposit-feeding clams on mud flats, and blue mussels on rocky shores.

- Analyze intertidal sediments and organism tissues for hydrocarbon concentrations.

State

Kachemak Bay National Estuarine Research Reserve

The Kachemak Bay National Estuarine Research Reserve (KBNERR) is managed by the Alaska Department of Fish and Game in cooperation with the Alaska Department of Natural Resources. Kachemak Bay is a long, wedge-shaped estuary in south central Alaska that is approximately 39 miles long and 24 miles wide adjacent to Lake Clark and Kenai Fjords National Parks. Goals of KBNERR are to conduct long-term research and monitoring to gain a better scientific understanding of natural and human processes occurring in Kachemak Bay watershed and estuarine ecosystem for use in coastal decision making. In 2003, SWAN will partner with KBNERR to produce a coastal research and monitoring database for the northern Gulf of Alaska.

Monitoring Programs

A primary objective of the Kachemak Bay Research Reserve is to monitor changes in the bay and determine the mechanisms causing those changes by linking monitoring with process-oriented experiments. Current monitoring is focused on temporal and spatial distribution patterns of marine organisms such as kelp forests, intertidal and

subtidal rocky shore algae, invertebrates, marine birds, shorebirds, marine mammals, and fishes. Fixed station ocean sensors are used to measure seawater temperature, water quality, pH, salinity, dissolved oxygen, sedimentation rates, and chlorophyll fluorescence. Measurements at fixed stations are augmented spatially by CTD transects along the across the axis of the bay.

Federal Agencies

USGS Alaska Science Center - Biological Science Office

As the lead biological science agency for the Department of the Interior (DOI) in Alaska, the *Alaska Science Center - Biological Science Office* is responsible for research trust lands and waters (including those of the National Park Service, Fish and Wildlife Service, Bureau of Land Management, and Minerals Management Service) and DOI trust species (including migratory birds, marine mammals, and anadromous fish) in Alaska, providing scientific information essential for resource management decisions.

Monitoring Programs

Alaska Biological Science Center and the Alaska Maritime National Wildlife Refuge are doing a long-term ecosystem study on seabird population dynamics and forage fish in lower Cook Inlet, funded by the EVOS Trustee Council. Development of coastal monitoring protocols & process-based studies to address landscape-scale variation in coastal communities of certain national parks in Alaska. ASC-BSO is developing detailed, scientifically credible methods for long-term monitoring of the rocky intertidal zone to help Park resource managers detect both human-induced and natural changes In cooperation with the National Park Service, ASC-BSO is conducting a number of research projects in Glacier Bay National Park and Preserve including oceanography, benthic marine fisheries population ecology, and sea otter colonization.

Alaska Maritime National Wildlife Refuge

The Alaska Maritime National Wildlife Refuge (AMNWR) is managed by the U.S. Fish and Wildlife Service. It consists of more than 2,400 islands, headlands, rocks, islets, spires and reefs of the Alaskan coast. The refuge stretches from Cape Lisburne on the Chukchi Sea to the tip of the Aleutians and eastward to Forrester Island on the border of British Columbia.

Monitoring Programs

Long-term data is collected annually for selected species of marine birds at breeding colonies to monitor the condition of the marine ecosystem and to evaluate the conservation status of species under the trust of the Fish and Wildlife Service. The strategy for colony monitoring includes estimating timing of nesting events, rates of reproductive success (e.g., chicks per nest), population trends and diet composition of representative species of various foraging guilds (e.g., off-shore diving fish-feeders, offshore surface-feeding fish-feeders, diving plankton-feeders) at geographically-dispersed breeding sites. This information enables managers to better understand

ecosystem processes and respond appropriately to resource issues. It also provides a basis for researchers to test hypotheses about ecosystem change. The value of the marine bird monitoring program is enhanced by having sufficiently long time-series to describe patterns for these long-lived species.

National Park Service

Southeastern and Central Alaska Networks

The Southeastern and Central Alaska Networks (SEAN/CAN) of the National Park Service include four coastal national park units on the northern Gulf of Alaska; Wrangell-St. Elias, Glacier Bay, Sitka, and Klondike Gold Rush.
Nationally, natural resource park units have been assigned to one of 32 separate monitoring networks. Although most ecological monitoring will be implemented on a network-wide basis, three Alaska networks have a unique opportunity to collaborate in monitoring Gulf of Alaska coastal ecosystems. The three networks will function as a team and share professional expertise, monitoring protocols, and data management strategies.

Ocean Alaska Science & Learning Center

The Ocean Alaska Science & Learning Center (OASLC) is based in Seward at Kenai Fjords National Park and the Alaska SeaLife Center. It was established in October 2000 as part of a national network of Natural Resource Challenge Learning Centers. The OASLC is a partnership dedicated to understanding and preserving the marine ecosystem connecting Alaska's National Parks through research and education. As such, the OASLC will help support and encourage more research in Alaska's eleven coastal National Parks and will provide education programs based on these research projects.

Goals of the OASLC include:

- Foster sustainable ecosystem policies through science and education.
- Explain resource issues in terms understood by wide audiences and in ways that encourage participation.
- Provide adequate scientific information to manage resources.
- Foster partnerships and opportunities for other agencies and institutions to participate in marine research and education.
- Provide the public with the opportunity to participate in the research process.
- Establish distance learning programs to educate state, national, and international audiences about Alaska's marine issues.
- Build and maintain physical and organizational infrastructure necessary to achieve mission.

Freshwater Monitoring

National Park Service

Alaska I&M Networks and Regional Office
The four Alaska Networks and staff of the Alaska Regional Office have a unique opportunity to collaborate in monitoring freshwater systems. Collectively, they may function as a team and share professional expertise, monitoring protocols, and data management strategies.

National Park Service- Water Resources Division (WRD)
WRD is responsible for providing water resource management policy, planning, and operational support to NPS managers Servicewide. These services and assistance are provided either directly to parks, clusters, regions, centers, and Washington Office or in cooperation with other NPS organizational units, agencies, or entities.

Areas where WRD may partner with networks for monitoring include:
- modifying and developing methods and procedures for applied water resources management; and
- conducting projects and studies in support of water resource needs.

Other Federal Agencies

US Geological Survey-Biological Resources Division- Alaska Science Center
The Alaska Science Center is responsible for research trust lands and waters (including those of the National Park Service, Fish and Wildlife Service, Bureau of Land Management, and Minerals Management Service) and DOI trust species (including migratory birds, marine mammals, and anadromous fish) in Alaska, providing scientific information essential for resource management decisions. Four divisions of the Alaska Science Center support the objectives of SWAN: The Biological Research Division (BRD), Water Resources Division (WRD), Research Division (GRD), and the Mapping Division. The research division has been actively involved in studies of sockeye salmon in Lake Clark since 1997.

US Fish and Wildlife Service, Water Resource and Refuges (FWS)
http://alaska.fws.gov/water/Water_resources.htm
Monitoring:
Refuges and national parks share common water resource and fisheries management issues. FWS operates a network of stream discharge gages to quantify the occurrence and distribution of surface water on selected refuges within the Alaska Region.

Detailed stream flow information has been or is currently being collected at 75 locations in Alaska. Stream flow data are available for 21 gage sites on the Arctic and Yukon Flats national wildlife refuges. Kenai Refuge stream flow data for 15 sites will be

published and available in the fall of 2002. Stream flow data are being collected and analyzed for an additional 39 gage sites located on the Becharof, Innoko, Togiak, and Kodiak refuges. Preliminary data for these stations is available on request.

Lake elevation surveys of selected lakes are conducted to determine lake water surface levels to support instream water right applications. Hydrologic investigations have been completed along the Coastal Plain (1002 Area) of the Arctic National Wildlife Refuge and on the Yukon Flats National Wildlife Refuge. Lake bathymetry data are available for 119 lakes and lake elevation data have been reported for 150 lakes on the Coastal Plain, and 63 lakes in the southern portion of the Yukon Flats National Wildlife Refuge.

The Water Resources Branch began a water quality program in the summer of 2001 to monitor water chemistry on the Togiak Refuge. Samples are collected at stream gage sites and analyzed several times each year. Data collection will expand to include the Kodiak Refuge in 2002.

Alaska Peninsula NWR
No stream gauging stations are being monitored in the Alaska Peninsula National Wildlife Refuge.

Becharof NWR
One stream gage at Egegik River is in operation at the outlet of Becharof Lake on the Becharof National Wildlife Refuge.

Kenai NWR
There were 15 stream discharge-gauging stations on the Kenai Wildlife Refuge.

Bureau of Land Management (BLM)
http://www.ak.blm.gov/ak930/hydro.html
BLM has extensive experience and expertise in hydrologic process studies such as the effects of water on soil, air and vegetation. BLM currently monitors stream flow on many large river systems on public lands in Alaska. This information is used, in part, to design channel reclamation for streams disturbed by placer mining. Other water resource projects include instream flow studies, water rights, aufeis, warm springs and snow surveys. BLM also manages units of the national wild and scenic rivers system and other federally administered rivers to protect resource and social values.

Environmental Protection Agency, Alaska Region
Many opportunities exist for partnering and sharing information with EPA in areas of wetland, water quality, and air quality monitoring. EPA has developed several national biological monitoring strategies to help ensure that chemical, physical and biological data is scientifically sound and geographically comparable. EPA has prepared "state-of-the-science" information that may prove help in developing biological assessment methods to evaluate both the overall ecological condition of lakes and wetlands. Common themes exist between the NPS vital signs monitoring program and EPA's

Environmental Monitoring and Assessment Program (EMAP). EMAP is designed to provide tools to monitor and assess the condition of the nation's freshwater and coastal systems.

National Weather Service
http://aprfc.arh.noaa.gov/
The National Weather Service provides on-line data about Alaska River Data Sites. There are few sites located near SWAN parks with minimal data. Site located near SWAN parks are:

- King Salmon Creek
- Newhalen River near Nondalton
- Tlikakila River near Port Alsworth
- Johnson River above lateral glacier near Tuxedni Bay
- Upper Nuka River near park boundary
- Resurrection River near Exit Glacier Bridge
- Resurrection River near Seward Highway Bridge

National Resource Conservation Service, Alaska Snow, Water & Climate Services
http://www.ak.nrcs.usda.gov/
NRCS collects and stores information on snow and ice surveys.

US Army, Corps. of Engineers, Alaska District
http://www.poa.usace.army.mil/en/cw/index.htm
The Civil Works Branch of the Alaska District studies potential water resource projects in Alaska. These studies, usually requested by a community in Alaska, analyze and solve water resource issues of concern to the local communities. These issues may involve navigational improvements, flood control or ecosystem restoration.

Besides studying water resource issues, the Civil Works Branch also track flood hazard data for over 300 Alaskan communities on floodplains or the sea coast. These data help local communities assess the risk of floods to their communities and prepare for potential future floods.

US Army, Cold Region Research and Environment Lab (CRREL)
http://www.crrel.usace.army.mil/
CRREL is a research and engineering facility located in Hanover, New Hampshire, with a project office at Fort Wainwright, Alaska. CRREL mission is to gain knowledge of cold regions through scientific and engineering research and put that knowledge to work. CRREL is the DoD's only laboratory that addresses the problems and opportunities unique to the world's cold regions. Of the several objectives of CRREL, the most closely related is the… "Conducting fundamental research to understand the nature and characteristics of snow, ice, frozen ground and other materials in cold environments including their interrelationship with other environmental parameters."

US Geological Survey, Water Resources of Alaska (USGS)
http://www-water-ak.usgs.gov/
USGS is the lead agency in Alaska for the collecting and processing of hydrologic data and conducting basic and applied research in hydrologic topics unique to cold climates. SWAN goals for long-term monitoring overlap many of the goals of the USGS National Water-Quality Assessment (NAWQA) Program which are to (1) describe current water-quality conditions for freshwater streams and aquifers, (2) describe how water quality is changing over time, and (3) improve our understanding of the primary natural and human factors affecting water quality.

State Agencies

Alaska Department of Environmental Conservation (ADEC)
ADEC is the principal state agency charged with monitoring water and air quality. Water resource priorities include:

- Assess the effectiveness and gaps in Alaska's water stewardship programs- Stewardship uses our existing laws and practices to preserve and protect water quality, water quantity and aquatic habitat.
- Assess the health of Alaska's surface and ground waters- with public input, establish a ranked ACWA Waters List to prioritize needs for more knowledge about conditions or to take corrective action.
- Direct funding towards data collection or corrective action projects that protect restore or recover the valued uses of waters that are at risk or polluted.

Alaska Department of Fish and Game (ADF&G)
ADF&G is the primary state agency involved with surveys and monitoring of freshwater fish and sport and commercial harvest of fish. In the past, the Sport Fish Division has partnered with NPS in southwest Alaska for lake surveys, creel surveys, and fish population surveys. Most recently, biologists from Dillingham worked with Lake Clark and Katmai staff in developing thermal habitat model to predict sustainable harvest of lake trout.

Local Governments

Information regarding freshwater monitoring activities within the local governments was not readily available. Possible partners are:

- Lake and Peninsula Borough
- Kenai Peninsula Borough
- Bristol Bay Borough
- Bristol Bay Native Corporation
- Cook Inlet Regional Corporation

Universities

Alaska Cooperative Fish and Wildlife Research Unit- UAF

The Alaska Cooperative Fish and Wildlife Research Unit is part of a nation-wide cooperative program, initiated in 1935, to promote research and graduate student training in the ecology and management of fish, wildlife and their habitats. Located on the UAF campus and administered through the UAF Institute of Arctic Biology, the Alaska Unit is staffed by USGS-salaried scientists who hold regular faculty appointments and UAF-salaried personnel who provide administrative support. At present, the Alaska Unit sponsors 44 projects and 30 graduate students in research topically ranging from productivity of fish and wildlife populations to effects of contaminants on coastal ecosystems, and geographically from southeast Alaska rain forests to the tundra of southwest Alaska and the North Slope. The unit has a long history of conducting limnological and fisheries research in southwestern Alaska including most of the network parks.

University of Alaska, Fairbanks – Water and Environmental Resource Center

(WERC)

http://www.uaf.edu/water/index.html

WERC's mission is to perform basic and applied research related to water and environmental resources, to train graduate students at master's and PhD levels in this field, and to disseminate pertinent research information to the public. Faculty, staff, and students at WERC are working to develop a better understanding of the arctic and subarctic environments. Research disciplines at WERC include environmental, civil, and mechanical engineering; oceanography; limnology; hydrology; microbiology; geochemistry; and hydraulics. WERC scientists are conducting cutting-edge research to help improve the quality of life for arctic inhabitants while supporting careful and sustainable development of Alaska's bountiful natural resources, protecting fragile ecosystems, and seeking to better understand the role of the arctic and subarctic in the global system.

Selected Current Research Projects:

- Hydrologic links with arctic freshwater and terrestrial systems
- The effect of climatic warming on arctic and subarctic ecosystems
- 3-D hydrological and thermal model for high-latitude watersheds
- Juvenile fish-passage design for stream crossings in Alaska
- Efficacy and toxicity testing of dispersants and dispersant-petroleum mixtures in the Alaskan marine environment
- Hydrologic processes in the Arctic (past project)

Other possible Universities:

- University of Washington, CESU
- Lake Illiamna Research Station

Committees and Consortiums

Interagency Hydrology Committee for Alaska
http://www-water-ak.usgs.gov/ihca/index.htm
The Interagency Hydrology Committee for Alaska (IHCA) is an organization of technical specialists working at the Federal, State, and local levels, who coordinate the collection and implementation of water resources related data throughout the State of Alaska. The IHCA meets twice per year to coordinate multi-agency issues and exchange of information.

Arctic System Science (ARCSS), Study of Environmental Arctic Change (SEARCH)
The Arctic Community-wide Hydrological Analysis and Monitoring Program (CHAMP) is a new initiative aimed at understanding the physical, biological, and biogeochemical controls on the components of the integrated arctic hydrologic cycle, and addressing linkages between the land and ocean. Key challenges in studying arctic hydrology include a sparse and declining observational network, lack of understanding of the basic hydrological processes operating across the pan-Arctic, and lack of cross-disciplinary synthesis. To address these challenges, members of the scientific community have recommended that the National Science Foundation invest in the development of a pan-Arctic hydrological analysis and monitoring program. The Arctic-CHAMP program will provide a framework for integrative studies of the pan-Arctic water cycle.

Other possible Committees and Consortiums:
- Exxon Valdez Oil Spill Trustee Council
- Cook Inlet Keepers
- Cook Inlet Information Management & Monitoring (CIIMMS)
- Trout Unlimited

Terrestrial Fauna Monitoring

State Agencies

Alaska Department of Fish and Game (ADF&G)

http://www.state.ak.us/adfg
ADF&G is the primary state agency responsible for the regulation, management, and monitoring of fish and wildlife. The ADF&G regularly cooperates with the NPS in studies of fish and wildlife. Most recently the ADF&G has joined forces with Katmai and Lake Clark National Parks & Preserves to develop an index for the evaluation of bear populations along the Parks' coastlines.

FEDERAL AGENCIES

Bureau of Land Management

(http://www.ak.blm.gov)
Although the Bureau of Land Management's primary focus is conveying land, providing interagency wildland fire management, overseeing the Joint Pipeline Office, and managing public lands under its administration, the BLM also conducts research and has expertise in fisheries and wildlife. BLM scientists have carried out studies on nesting raptors in southwestern Alaska, bald eagle nest surveys, bird communities, and numerous caribou, moose, and dall sheep studies, among others. Additional, the BLM has authority over a number of areas near southwest Alaska parks making them a logical candidate for interagency cooperation.

U.S. Fish and Wildlife Service

(http://alaska.fws.gov)
The mission of the U.S. Fish & Wildlife Service is to work with others to conserve, protect, and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people. Three national wildlife refuges - Becharof, Alaska Peninsula, Alaska Maritime, and Kodiak - are adjacent to or in close proximity to southwest Alaska parks. To this end the FWS has worked extensively with the NPS to study and manage wildlife and its habitat. The FWS regularly monitors avian productivity and survivorship, caribou, brown bear, and moose populations, migratory birds, raptors, and other wildlife and habitat.

U.S. Geological Survey – Alaska Science Center - Biological Science Office

(http://www.absc.usgs.gov)

The USGS Alaska Science Center - Biological Science Office is the lead biological science agency for the Department of the Interior (DOI) in Alaska. It is the lead research unit for DOI lands and trust species in Alaska. The staff of the Alaska Science Center - Biological Science Office includes research wildlife biologists, research fishery biologists, a research geneticist, a zoologist, a marine ecologist, a research statistician, a veterinarian, a research ecologist, biologists, and a support staff of biological technicians, statistical assistants, and laboratory technicians. The Center has expertise in the following areas:

- Ecosystem interactions in marine, freshwater, and terrestrial arctic and subarctic environments on DOI lands (National Wildlife Refuges, National Parks, BLM); the Bering, Chukchi, and Beaufort seas; and the northern Gulf of Alaska
- Global climate change in arctic and subarctic ecosystems
- Impacts of oil and gas development on arctic and subarctic systems and key DOI trust species
- Assessment of human related (e.g., subsistence, recreation, logging, military activities, mining) impacts on DOI trust species in arctic and subarctic ecosystems
- Research on internationally shared DOI trust species and DOI programs
- Use of fish and wildlife remote sensing and GIS technology development and application to understand ecosystem functions
- Inventory and monitoring protocol development for DOI trust species in arctic and subarctic ecosystems
- Population dynamics, modeling, and ecology of Pacific salmonids, marine mammals, terrestrial mammals, and migratory birds

Monitoring Programs

Areas of work have included:

- Development of long-term monitoring protocols for Denali National Park and Preserve, and a long-term research program on wildlife and habitats of the coastal plain of the Arctic National Wildlife Refuge.
- The use of molecular genetic techniques to assess the systematics and population structure of arctic and subarctic DOI trust species in arctic and subarctic ecosystems.
- Use of molecular genetic methodologies in studies of the ecology and degree of spatial structuring in Alaskan avian and mammalian populations.
- The role of arctic and subarctic environments in maintaining nationally important migratory bird populations.
- The ecology of terrestrial mammals and the role of top herbivores and carnivores in impacting the dynamics of arctic and subarctic terrestrial systems.
- Sport and subsistence harvests of declining populations of arctic nesting birds.
- Increased impacts of recreational activities on DOI trust species in National Wildlife Refuges and National Parks.
- Ecology and behavior of foxes and avian predators in geese nesting areas on the Yukon-Kuskokwim Delta, Alaska.
- Status and demography of the bristle-thighed curlew.
- Determine habitat partitioning and population dynamics of a naturally regulated brown bear population on the coast of Katmai National Park, Alaska.
- Frog abnormalities on the Kenai Peninsula and Interior Alaska.

Consultants, Committees, Consortiums, & NGOs

ABR Inc.

(www.abrinc.com; P.O. Box 80410, Fairbanks, AK 99708; Tel: (907) 455-6777)
ABR Inc. is a private consulting firm specializing in environmental research and services. They have conducted inventories of wetland resources and wildlife; species inventory and censusing; habitat modeling and resource selection analysis; long-term population monitoring; ecological monitoring; and vegetation studies.

Alaska Bird Observatory

(http://www.alaskabird.org)
ABO specializes in long-term studies of migrant and resident birds of Alaska. Among their studies have been: anthropogenic threats to coastal birds in southcentral and southeastern Alaska; temporal and spatial patterns of breeding passerine migrants; and abundance, migration and habitat use of birds breeding in Denali National Park.

Universities

Environment and Natural Resource Institute (ENRI) - University of Alaska, Anchorage

(http://www.uaa.alaska.edu/enri)
ENRI consists of the Arctic Environmental Information and Data Center (AEIDC), the Alaska State Climate Center, the Alaska Natural Heritage Program, and Resource Solutions. ENRI's chief goal is to provide sound scientific data and analyses without advocacy for use in natural resource and environmental decision making. ENRI 's staff includes specialists in environmental policy and regulatory analysis, natural resources management and planning, aquatic ecology, zoology, botany, geology, fisheries and wildlife biology, microbiology, climatology, oceanography, environmental chemistry and toxicology, cultural and physical anthropology, subsistence and socioeconomics, consensus-building techniques, library science, graphic design and production, and Geographic Information Systems.

Monitoring Programs

Areas of research have included:

- TransAlaska Pipeline System environmental monitoring.
- Vegetation classification and wetlands inventories.
- Rare and endangered species research, inventory, and evaluation.
- Alaska-specific environmental sampling protocols.

More specific to the I&M Program, the Alaska Natural Heritage Program (AKNHP) has conducted vascular plant inventories for SEAN and SWAN since 2001.

University of Alaska Fairbanks

The Alaska Cooperative Fish and Wildlife Research Unit

(http://mercury.bio.uaf.edu/akcfwru/unit)

The research program of the Coop Unit is aimed at understanding the ecology of Alaska's fish and wildlife; evaluating impacts of land use and development on these resources; and relating effects of social and economic needs to production and harvest of natural populations. The Coop Unit is currently sponsoring 44 projects and 30 graduate students in research ranging from productivity of fish and wildlife populations to effects of contaminants on coastal ecosystems. Some of these studies include: an assessment of moose-habitat relationships in the Alaksa Peninsula and Becharof Wildlife Refuges; habitat suitability for Dall's sheep in Wrangell-St. Elias National Park and Preserve; and the effects of fire history and topography on the distribution of moose.

The Institute of Arctic Biology

(http://mercury.bio.uaf.edu/iab)

The IAB's mandate is to study the adaptations of plants and animals to the special climates and environments of arctic and subarctic regions. A wide range of research projects are carried out by the IAB. These include: the epidemiology of Hepatitis B on an arctic ground squirrels; ecological monitoring of small mammals in Denali National Park and Preserve; overwintering strategies of the freeze-tolerant wood frog *Rana sylvatica* in Interior Alaska; the coevolution of two groups of Beringian mammals, arctic hares and tundra shrews, and their cestode and nematode parasites; and the phylogeography and coevolution of a Beringian vole, *Microtus oeconomus*, and its cestode parasite.